Integrated *In-Situ* and Resonant X-ray Studies Beamline (ISR)

Physics of Materials for the 21st Century

ISR at NSLS-II

Combination of NSLS-II brightness with powerful capabilities for *integrated* materials physics studies unique in the world:

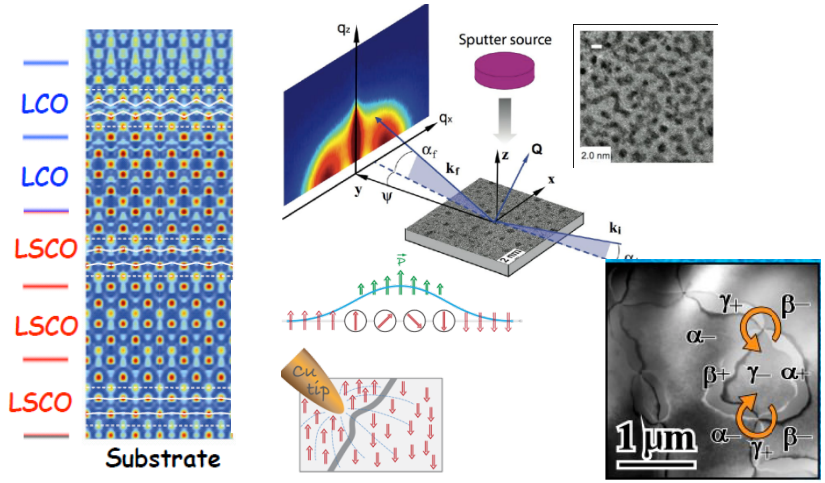
- Highly flexible range of sample environments
- Fully controllable incident polarization
- Microfocusing with good focal distance
- Resonance studies with energies 2.4-23 keV
- Coherent studies (XPCS,CDI,XRIM)
- 13 T magnetic field

Examples of Science Areas & Impact

•CORRELATED ELECTRON MATERIALS: Combine magnetic/orbital-sensitive scattering with domain imaging and high magnetic fields.

•FUNCTIONAL SURFACES AND INTERFACES: Probe *in-situ* the atomic structure of surfaces and interfaces needed for energy conversion and information processing needs.

•SURFACE AND THIN-FILM GROWTH PROCESSES: Study in real time fundamental surface processes in PLD, MBE, ALD, sputter deposition and other techniques.



POWERFUL COMBINATION OF MATERIALS PHYSICS CAPABILITIES ENABLED BY ISR

Left: Sub-Angstrom resolution electron density map from CTR measurements of a $LaSrCuO_4$ epitaxial film showing interfacial superconductivity (Zhou *et al.*, PNAS 2010).

Top: Real-time GISAXS patterns during first stages of WSI_2 film growth showing nanoparticle formation and corresponding TEM image (Zhou *et al.*, PRB 2010).

Right and Bottom: In-situ imaging of evolving ferroelectric domains— important for exploring the physics of domain wall motion controlled by electric field in multiferroics (T. Choi *et al.*, Nature Materials 2010).

ISR Beamline Capabilities

TECHNIQUE(S): RXS; XMCD; Polarized XRD; GID; CTR; TXRF; GISAXS; *in-situ* XPCS; *in-situ* CDI; *in-situ* XRIM

SOURCE: 3 m undulator in high-β straight section

ENERGY RANGE: 2.4-23 keV

POLARIZATION CONTROL: Dual phase plates